

ENHANCED LANDSAT IMAGES OF ANTARCTICA AND PLANETARY EXPLORATION*

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Since early in the Landsat program, black-and-white paper prints of band 7 (near infrared) of the Landsat multispectral scanner have been used extensively to prepare semicontrolled maps of Antarctica. Only recently, however, have image-processing techniques been employed to enhance fine detail and to make controlled image-mosaic maps in color. These techniques--restoration of badly saturated images, special stretches to bring out structures in snow and ice, and high-pass filters combined with ratioing to enhance detail--have led to a number of important results. The processed images show many subtle structures in the ice, such as flow lines on ice streams and ice shelves, ridges or double ridges on ice rises, peculiar splotchy surface markings on ice sheets, and the subsurface topography of ice-covered mountains where the ice cover is thin. Large transverse crevasses on the floating part of glaciers and ice streams retain their identities over many years, so that glacier velocities can be measured on repetitive pictures. Landsat multispectral images of Antarctica also help to expand our knowledge of extraterrestrial bodies by showing bare-ice areas as bright blue patches; on such patches meteorites tend to be concentrated and are collected. Many subtle flow features in Antarctic ice streams resemble features at the mouths of Martian outflow channels, which suggests that the channels also contained ice. Furthermore, flow lines in Antarctic ice sheets that merge with ice shelves resemble Martian flow features associated with dissected terrain along the Martian northern highland margin, and support the concept that ice was involved in the transport of material from the southern highlands to the northern lowland plains. In Antarctica, as on Mars, the virtual absence of fluvial activity over millions of years has permitted the growth of glacial and eolian features to unusually large sizes.

*(Published in Geological Society of America, Abstracts with Programs, 1986, v. 18, no. 6, p. 677.)